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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to organic electroluminescence devices.

[0002]

[Description of the Prior Art]Conventionally, although used as panel type light sources, such as a back light, for example, in order to make this light emitting device drive, the high tension of exchange is required for inorganic electroluminescence devices. These days came and the organic electroluminescence devices (organic electroluminescence element: organic EL device) which used organic materials for the luminescent material were developed. Appl. Phys. Lett., and [51, 913] (1987) .Organic electroluminescence devices have the structure pinched between the anode and the negative pole in the thin film containing a fluorescence organic compound, and inject an electron and an electron hole (hole) into this thin film, It is an element which emits light using the light emitted when an exciton (exciton) is made to generate and this exciton is deactivated by making it recombine. organic electroluminescence devices -- severalV - several 10 -- it is a low voltage of about V direct current, and luminescence of various colors (for example, red, blue, green) is possible by being able to emit light and choosing the kind of fluorescence organic compound. The application to various light emitting devices, a display device, etc. is expected from the organic electroluminescence devices which have such a feature. However, generally, light emitting luminance is low and is not enough practically.

[0003]As how to raise light emitting luminance, the organic electroluminescence devices which used tris(8-quinolate) aluminum as a luminous layer, and used the host compound, the coumarin derivative, and the pyran derivative as a guest compound (dopant), for example are proposed. J.Appl. Phys., and [65, 3610] (1989) .Organic electroluminescence devices used tris (8-quinolate) aluminum as a luminous layer, and using the host compound and the

quinacridone derivative (for example, Quinacridone) as a guest compound are proposed (JP,3-255190,A). Organic electroluminescence devices used tris(8-quinolate) aluminum as a luminous layer, and using a host compound and 5,12-dimethyl Quinacridone ("N,N'-dimethyl Quinacridone") as a guest compound are proposed. Appl. Phys.Lett., and [70, 1665] (1997). However, these light emitting devices are also hard to be referred to as having sufficient light emitting luminance. The adhesion of the layer and electrode (for example, negative pole) containing Quinacridone and 5,12-dimethyl Quinacridone was scarce, and it became clear that the it was improved on the occasion of prolonged use. Now, organic electroluminescence devices which emit light to high-intensity further are desired.

[0004]

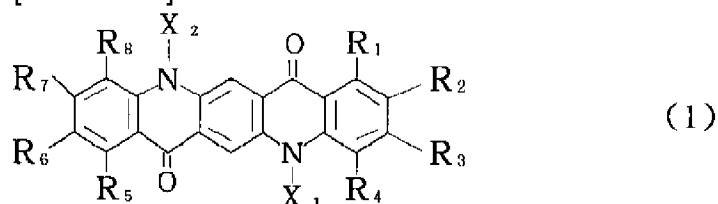
[Problem(s) to be Solved by the Invention]The technical problem of this invention is providing the organic electroluminescence devices which are excellent in luminous efficiency and emit light to high-intensity.

[0005]

[Means for Solving the Problem]This invention persons came to complete this invention, as a result of examining organic electroluminescence devices wholeheartedly. Namely, organic electroluminescence devices in which this invention pinches further at least a layer containing at least one sort of compounds expressed with a following general formula (1) and the (** 2) to inter-electrode [of ** couple], ** Organic electroluminescence devices given in ** a given layer containing a compound expressed with a general formula (1) is a luminous layer, ** Organic electroluminescence devices given in ** a given layer containing a compound expressed with a general formula (1) is an electron injection transporting bed, ** Organic electroluminescence devices given in either the aforementioned ** to which a layer containing a compound expressed with a general formula (1) is characterized by containing a luminescent organometallic complex - **, ** It is further related inter-electrode [of a couple] inter-electrode [of organic electroluminescence devices given in either the aforementioned ** which has a hole-injection transporting bed - **, and ** couple] with either the aforementioned ** which has an electron injection transporting bed - **, without organic electroluminescence devices of a statement.

[0006]

[Formula 2]



the inside of a formula, $R_1 - R_8$ -- a hydrogen atom, a halogen atom, and a straight chain.

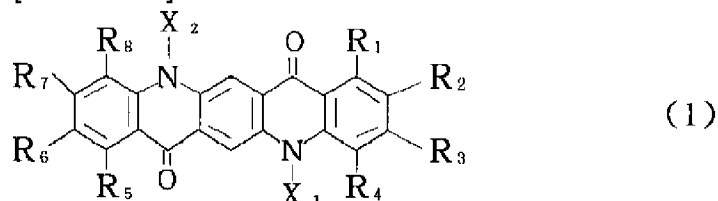
Branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, Or the aryl group which is not replaced [substitution or] is expressed and X_1 and X_2 express the aralkyl group which is not replaced [the aryl group which is not replaced / a hydrogen atom, a straight chain, branching or an annular alkyl group, substitution, or /, substitution, or]. However, at least three of $R_1 - R_8$ are an aryl group which is not replaced [a halogen atom a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or], and X_1 and X_2 do not serve as a hydrogen atom simultaneously.

[0007]

[Embodiment of the Invention] Hereafter, this invention is explained in detail. The organic electroluminescence devices of this invention pinch further at least the layer containing at least one sort of compounds expressed with a following general formula (1) and the (** 3) to inter-electrode [of a couple].

[0008]

[Formula 3]



the inside of a formula, $R_1 - R_8$ -- a hydrogen atom, a halogen atom, and a straight chain.

Branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, Or the aryl group which is not replaced [substitution or] is expressed and X_1 and X_2 express the aralkyl group which is not replaced [the aryl group which is not replaced / a hydrogen atom, a straight chain, branching or an annular alkyl group, substitution, or /, substitution, or]. However, at least three of $R_1 - R_8$ are an aryl group which is not replaced [a halogen atom a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or], and X_1 and X_2 do not serve as a hydrogen atom simultaneously.

[0009] In a general formula (1), $R_1 - R_8$ express the aryl group which is not replaced [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or]. However, at least three of $R_1 - R_8$ are an aryl group which is not replaced [a halogen atom a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or].

An aryl group expresses heterocyclic aromatic groups, such as carbocyclic aromatic groups, for example, a furil group, such as a phenyl group and a naphthyl group, a thienyl group, and a pyridyl group, for example.

[0010]As an example of R_1 in a general formula (1) - R_8 , hydrogen atom; -- halogen atom (for example, fluorine atom, chlorine atom, bromine atom); -- a straight chain of the carbon numbers 1-16, branching or an annular alkyl group (for example, a methyl group, an ethyl group, and n-propyl group.) An isopropyl group, n-butyl group, an isobutyl group, a sec - butyl group, A tert-butyl group, n-pentyl group, an isopentyl group, a neopentyl group, A tert-pentyl group, a cyclopentyl group, n-hexyl group, a 3,3-dimethylbutyl group, A cyclohexyl group, n-heptyl group, a cyclohexylmethyl group, n-octyl group, A tert-octyl group, a 2-ethylhexyl group, n-nonyl group, n-decyl group, n-dodecyl, n-tetradecyl group, n-hexadecyl group, etc.; A straight chain of the carbon numbers 1-16, branching or an annular alkoxy group (for example, a methoxy group and an ethoxy basis.) n-propoxy group, an isopropoxy group, n-butoxy group, an isobutoxy group, A sec - butoxy group, an n-pentyloxy group, a neopentyl oxy group, a cyclopentyloxy group, an n-hexyloxy group, a 3,3-dimethyl butyloxy group, a cyclohexyloxy group, n-heptyloxy group, n-octyloxy group, 2-ethylhexyloxy group, n-nonyloxy group, an n-decyloxy group, n-dodecyloxy group, n-tetradecyloxy group, n-hexadecyloxy group, etc.;

[0011]Or an aryl group which is not replaced [substitution of the carbon numbers 4-16, or]. for example, a phenyl group, 2-methylphenyl group, and 3-methylphenyl group. 4-methylphenyl group, 4-ethyl phenyl group, a 4-n-propyl phenyl group, 4-isopropyl phenyl group, a 4-n-buthylphenyl group, a 4-tert-buthylphenyl group, 4-isopentyl phenyl group, a 4-tert-pentyl phenyl group, A 4-n-hexyl phenyl group, 4-cyclohexyl phenyl group, a 4-n-octyl phenyl group, A 4-n-decyl phenyl group, 2, 3-dimethylphenyl group, 2, 4-dimethylphenyl group, 2, 5-dimethylphenyl group, 3, 4-dimethylphenyl group, 5-indanyl group, 1, 2, 3, a 4-tetrahydro 5-naphthyl group, 1, 2 and 3, a 4-tetrahydro 6-naphthyl group, 2-methoxyphenyl group, 3-methoxyphenyl group, 4-methoxyphenyl group, 3-ethoxy phenyl group, 4-ethoxy phenyl group, a 4-n-propoxy phenyl group, 4-isopropoxy phenyl group, a 4-n-butoxy phenyl group, a 4-n-pentyloxy phenyl group, a 4-n-hexyloxy phenyl group, 4-cyclohexyloxy phenyl group, A 4-n-heptyloxy phenyl group, a 4-n-octyloxy phenyl group, A 4-n-decyloxy phenyl group, a 2,3-dimethoxy phenyl group, A 2,5-dimethoxy phenyl group, a 3,4-dimethoxy phenyl group, a 2-methoxy-5-methylphenyl group, A 3-methyl-4-methoxyphenyl group, 2-fluorophenyl group, 3-fluorophenyl group, 4-fluorophenyl group, 2-chlorophenyl group, a 3-chlorophenyl group, 4-chlorophenyl group, 4-bromo phenyl group, 4-trifluoro methylphenyl group, A 3,4-dichlorophenyl group, a 2-methyl-4-chlorophenyl group, A 2-chloro-4-methylphenyl group, a 3-chloro-4-methylphenyl group, A 2-chloro-4-methoxyphenyl group, 4-phenyl phenyl group, 3-phenyl phenyl group, 4-(4'-methylphenyl) phenyl group, 4-(4'-methoxyphenyl) phenyl group, They are 1-naphthyl group, 2-naphthyl group, a 4-ethoxy-1-naphthyl group, a 6-methoxy-2-

naphthyl group, a 7-ethoxy-2-naphthyl group, 2-furil group, 2-thienyl group, 3-thienyl group, 2-pyridyl group, 3-pyridyl group, 4-pyridyl group, etc.

[0012]More preferably, are a hydrogen atom, a fluorine atom, a chlorine atom, an alkyl group of the carbon numbers 1-10, an alkoxy group of the carbon numbers 1-10, or an aryl group of the carbon numbers 6-10, and still more preferably, They are a hydrogen atom, a fluorine atom, a chlorine atom, an alkyl group of the carbon numbers 1-6, an alkoxy group of the carbon numbers 1-6, or a carbocyclic aromatic group of the carbon numbers 6-10. At least three of $R_1 - R_8$ However, a halogen atom, Express an aryl group which is not replaced [a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or], and more preferably, 3-8 pieces express an aryl group which is not replaced [a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching an annular alkoxy group, substitution, or], and still more preferably, 3-6 pieces express an aryl group which is not replaced [a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching an annular alkoxy group, substitution, or], and preferably especially, 3-4 pieces express an aryl group which is not replaced [a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or].

[0013]In a general formula (1), X_1 and X_2 express an aralkyl group which is not replaced [an aryl group which is not replaced / a hydrogen atom, a straight chain, branching or an annular alkyl group, substitution, or /, substitution or]. However, X_1 and X_2 do not serve as a hydrogen atom simultaneously. Preferably A hydrogen atom, a straight chain of the carbon numbers 1-16, branching, or an annular alkyl group, A carbocyclic aromatic group of the carbon numbers 6-20, a heterocyclic aromatic group of the carbon numbers 4-20, Are a carbocyclic aralkyl group of the carbon numbers 7-20, or a heterocyclic aralkyl group of the carbon numbers 4-20, and more preferably, A hydrogen atom, a straight chain of the carbon numbers 1-10, branching or an annular alkyl group, a carbocyclic aromatic group of the carbon numbers 6-10, Are a heterocyclic aromatic group of the carbon numbers 3-10, a carbocyclic aralkyl group of the carbon numbers 7-10, or a heterocyclic aralkyl group of the carbon numbers 4-10, and preferably especially, They are a hydrogen atom, a straight chain of the carbon numbers 1-6, branching or an annular alkyl group, a carbocyclic aromatic group of the carbon numbers 6-10, or a carbocyclic aralkyl group of the carbon numbers 7-10.

[0014]As an example of an aryl group which is not replaced [a straight chain of X_1 and X_2 , branching or an annular alkyl group, substitution, or], an aryl group which is not replaced [branching quoted as an example of $R_1 - R_8$ or an annular alkyl group, substitution, or] can be illustrated, for example. As an example of an aralkyl group which is not replaced [substitution

of X_1 and X_2 , or], For example, benzyl, phenethyl group, alpha-methylbenzyl group, alpha, and alpha-dimethylbenzyl group, 1-naphthyl methyl group, 2-naphthyl methyl group, a furfuryl group, 2-methylbenzyl group, 3-methylbenzyl group, 4-methylbenzyl group, 4-ethylbenzyl, 4-isopropylbenzyl, a 4-tert-butylbenzyl group, 4-n-hexylbenzyl, A 3,4-dimethylbenzyl group, 3-methoxybenzyl group, 4-methoxybenzyl group, 4-ethoxybenzyl group, 4-n-butoxybenzyl, 4-fluorobenzyl, 3-fluorobenzyl, 2-chlorobenzyl, 4-chlorobenzyl, etc. can be mentioned.

[0015]In organic electroluminescence devices of this invention, in a general formula (1), at least three of $R_1 - R_8$. A halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, Or it is the big feature to use at least one sort of compounds which have an aryl group which is not replaced [substitution or] and in which X_1 and X_2 do not serve as a hydrogen atom simultaneously, and it becomes possible to provide organic electroluminescence devices which emit light to high-intensity by this. Although a reason is not certain, unreplaced Quinacridone and its derivative (for example, 5,12-dimethyl Quinacridone), and a quinacridone derivative expressed with a general formula (1) concerning this invention by an effect of the substituent. A state of aggregation of a quinacridone derivative can change and, thereby, it can be surmised that it will be because [an electrical property etc. change] physical.

[0016]As an example of a compound expressed with a general formula (1) concerning this invention, although the following compounds can be mentioned, this invention is not limited to these, for example. Naming of a compound expressed with a general formula (1) followed a method given in Chem. Rev., and 67 and 1 (1967), for example.

- Illustration compound Number

1. the 5-ethyl- 2 and 9 and 11-trimethyl Quinacridone . 2. 5,12-dimethyl- 2,9,11-trimethyl Quinacridone 3. 5,12-diethyl- 1,3,8,10-tetramethyl Quinacridone 4. 5,12-dimethyl- 1,8-dimethyl- 4,11-n-butyl chinae cortex . KURIDON 5. 5,12-diethyl- 1,4,8,11-tetramethyl Quinacridone 6. 5,12-di-n-butyl 1,4,8,11-tetramethyl KINAKU The Liddon 7. 5,12-di-n-hexyl- 1, 4, and 8 and 11-tetraethyl chinae cortex . KURIDON 8. 5-methyl-12-ethyl-1,4,8,11-tetramethyl KINAKU Liddon 9. 5-methyl-2,4,9,11-tetramethyl Quinacridone 10. 5,12-dimethyl- 2, 4, and 9 and 11-tetramethyl Quinacridone . 11. 5,12-diethyl- 2,4,9,11-tetramethyl Quinacridone 12. 5,12-diisopropyl- 2,9-di-tert-butyl-4,11- Dimethyl Quinacridone 13. 5,12-diphenyl- 2, 4, and 9, 11-tetramethyl chinae-cortex KURIDO N[0017]